

WHAT IS CLAIMED IS:

1. A duplexer comprising:
two surface acoustic wave (SAW) filters having
5 different center frequencies;
a phase matching circuit that matches phases of
the two SAW filters;
a package in which the SAW filters and the phase
matching circuit are housed, the package having a die-
10 attached layer on which a chip of the SAW filters is
facedown mounted; and
ground line patterns provided on the die-attached
layer and an underlying layer that underlies the die-
attached layer, the ground line patterns forming
15 inductances.

2. The duplexer as claimed in claim 1, wherein
the duplexer comprises a structure in which the ground
line patterns on the die-attached layer and the
20 underlying layer are connected by a via provided in the
package.

3. The duplexer as claimed in claim 1, wherein
the ground line patterns have different widths and/or
25 lengths.

4. The duplexer as claimed in claim 1,
wherein:
the two SAW filters have a plurality of stages
30 composed of series resonators and parallel resonators;
and
one of the ground line patterns connected to one
of the parallel resonators shared by two stages is
longer than another one of the ground line patterns
35 connected to another one of the parallel resonators
specifically used in one of the stages.

5. The duplexer as claimed in claim 1,
wherein:

the package has yet another layer on which a
first phase matching line pattern that forms the phase
5 matching circuit; and

the ground wiring lines include a ground wiring
line that runs above the first phase matching line
pattern.

10 6. The duplexer as claimed in claim 1, wherein
the package comprises:

a first phase matching pattern layer on which a
first phase matching line pattern of the phase matching
circuit is formed;

15 a second phase matching pattern layer on which a
second phase matching line pattern of the phase
matching circuit is formed, the second phase matching
pattern layer being located below the first phase
matching pattern layer;

20 first, second and third ground patterns provided
so that the first phase matching line pattern is
interposed between the first and second ground patterns,
and the second phase matching line pattern is
interposed between the second and third ground patterns,

25 a distance between the first and second ground
patterns being different from that between the second
and third ground patterns.

7. The duplexer as claimed in claim 6, wherein
30 the distance between the first and second ground
patterns is shorter than the distance between the
second and third ground patterns.

8. The duplexer as claimed in claim 1, wherein
35 the phase matching circuit comprises a phase matching
line pattern having an impedance smaller than that of
an external circuit coupled to the duplexer.

9. The duplexer as claimed in claim 6, wherein the first and second phase matching line patters have crossing portions.

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10. The duplexer as claimed in claim 6, wherein the second phase matching line pattern is longer than the first phase matching line pattern.

10 11. The duplexer as claimed in claim 6, wherein the first ground layer is interposed between the die-attached layer and the first phase matching line pattern.

15 12. The duplexer as claimed in claim 1, wherein:

the ground line patterns include a receive ground line pattern involved in a receive system of the duplexer; and

20 the receive ground line pattern is connected to only a ground pattern on a cap mounting layer of the package and a footpad formed on a lowermost layer of the package.

25 13. The duplexer as claimed in claim 12, wherein:

the ground line patterns include a transmit ground line pattern involved in a transmit system of the duplexer; and

30 the transmit ground line pattern is connected to the receive ground pattern via only the footpad.

35 14. The duplexer as claimed in claim 1, wherein the die-attached layer has flip-chip bonding pads connected to pads on a main surface of the chip.

15. The duplexer as claimed in claim 1,

wherein:

the phase matching circuit comprises a line pattern that runs on multiple layers of the package; and

5 ends of the line pattern are diagonally located on one of the multiple layers.

16. A duplexer comprising:

10 a chip having first and second surface acoustic wave (SAW) filters having different center frequencies; a phase matching circuit that matches phases of the first and second SAW filters; and

15 a package in which the first and second SAW filters and the phase matching circuit are housed, resonators of the first and second SAW filters being arranged side by side in a SAW propagating direction,

20 the chip having pads located further out than the resonators.

17. An electronic apparatus comprising:

an antenna;

a duplexer connected to the antenna; and

25 transmit and receive systems connected to the duplexer,

the duplexer comprising:

two surface acoustic wave (SAW) filters having different center frequencies;

30 a phase matching circuit that matches phases of the two SAW filters;

a package in which the SAW filters and the phase matching circuit are housed, the package having a die-attached layer on which a chip of the SAW filters is facedown mounted; and

35 ground line patterns provided on the die-attached layer and an underlying layer that underlies the die-attached layer, the ground line patterns forming

inductances.

18. An electronic apparatus comprising:
 - an antenna;
 - 5 a duplexer connected to the antenna; and
 - transmit and receive systems connected to the duplexer,
 - the duplexer comprising:
 - a chip having first and second surface acoustic
 - 10 wave (SAW) filters having different center frequencies;
 - a phase matching circuit that matches phases of the first and second SAW filters; and
 - a package in which the first and second SAW filters and the phase matching circuit are housed,
 - 15 resonators of the first and second SAW filters being arranged side by side in a SAW propagating direction,
 - the chip having pads located further out than the resonators.

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